

WOLFFIA PAPULIFERA THOMPSON (LEMNACEAE), NEW TO MICHIGAN

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ABSTRACT

Wolffia papulifera Thompson is reported for the first time from Michigan and LaPorte County, Indiana. An illustration of *W. papulifera* in flower and electron photomicrographs of its echinate pollen surface are included.

Two recent collections to the Morton Arboretum (MOR) herbarium of *Wolffia papulifera* Thomps. were new records for Michigan and LaPorte County, Indiana. Deam (1940) had reported it from Ohio, Indiana, Illinois, Kentucky, Tennessee, Missouri, Arkansas, and Kansas. Daubs (1965) monographed Lemnaceae and cited collections from Maryland, Florida, Louisiana, Illinois, Missouri, Kansas, Mexico, and Argentina. Other reports include it from Texas (Blake 1952) and Oklahoma (Correll & Correll 1975). In the most recent monograph of Lemnaceae (Landolt 1980), *W. papulifera* and *W. punctata* Grisebach (in part) are reduced to synonymy under *W. brasiliensis* Weddell. Now included in its distribution in North America also are Alabama, Massachusetts, North Carolina, Pennsylvania, and South Carolina.

Voss (1972) did not record it from Michigan nor did Swink and Wilhelm (1979) record it from the seven Indiana counties and one Michigan county of the Chicago region flora. Deam's Indiana record of *Wolffia papulifera* was from Posey County in the extreme southwest corner of the state. Lake County, Illinois (Mohlenbrock & Ladd 1978) was the nearest known locality to Michigan and northwestern Indiana until the Morton Arboretum accessioned its first record from Cook County, Illinois (J. Higgins, s.n. 1983). Under *W. papulifera* or *W. brasiliensis*, the state and county records are still valid. The collection data are:

MICHIGAN: Berrien Co.: Buttonbush swamp in NW quadrant of Bridgman interchange of I-94, 7 Sep 85, K. Dritz s.n. (MOR).

INDIANA: LaPorte Co.: Hudson Lake, ca 2 mi W of New Carlisle, 5 Sep 85, G. Wilhelm & K. Dritz 13082 (MOR).

Wolffia papulifera (sensu Daubs) and *W. brasiliensis* (sensu Landolt) is distinguished from the other species of *Wolffia* on the basis of its central conical papilla on the upper surface of the frond.

Both collections from Indiana and Michigan had plants that were in prime flower and here presented are illustrations of the relatively unknown flowers of *Wolffia*. The smallest known flowering plants are in this genus (Daubs 1965) and its flowers are equally as small. The plants are monoecious with a single stamen in the staminate flower and one pistil in the pistillate flower. Both flowers lack a perianth and are housed in a large central cavity. Six stages are shown (Fig. 1). The central papilla is evident in the vegetative and incipient flowering condition (A & B). In C, on top of the frond, is a round opening where the papilla was and through which the style with its slightly impressed, terminal stigma emerges. Often the anther sacs can be seen within the central chamber. In all cases examined, the style was exposed prior to the emergence of the stamen and always on the side toward the vegetative reproductive pouch or bud. The stamen emerged (D–F) after the stigma appeared to dry up slightly. Anthesis occurred by the breakdown of a line of cells across the top and between the two anther sacs, after which the sacs spread out laterally upon dehiscence (F). The fruit remains within the flower chamber, however, mature fruit was not evident in our material.

Anthers were dissected out of the plants and their anther sacs opened so as to examine pollen grains. They were measured with an ocular micrometer using a Zeiss Photomicroscope II. They varied in size from 26–28 μ , somewhat larger than the 18–22 μ reported by Daubs (1965). The surface of the pollen grains were examined with an ISI SX-40 electron microscope after they had been coated with gold-paladium in a Polaron Sputter Coater. Although the pollen are distorted due to their collapse in the vacuum, they are, as reported by Daubs (1965), echinate (Fig. 2).

An effort was made to obtain chromosome counts of *Wolffia papulifera*, however all the squashes of the anthers resulted in either microspores beyond the spore tetrad stage or fully developed pollen grains. It is not clear when microsporogenesis occurs but it must be very early in the development of the staminate flower. Chromosome counts are available for *Wolffia* (Landolt, 1980) based on somatic cells. For *W. brasiliensis*, the variation is extreme with $2n = 20, 40, 50, 60,$ and 80 .

ACKNOWLEDGMENTS

I would like to thank Gerould Wilhelm and Ken Dritz for making their collections of *Wolffia* available for study. The beautiful drawing of *Wolffia papulifera* was done by Nancy Bartels.

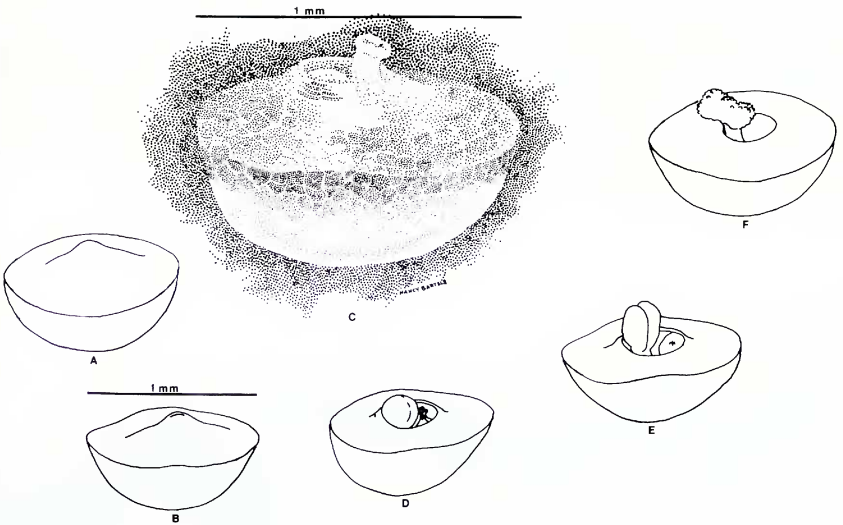


Fig. 1. A — E: *Wolffia papulifera* stages of flowering (W. *Wolffia* & Dritz 13082). A. Vegetative plant. B. Incipient flowering. C. Receptive pistillate flower. D — E. Maturation of staminate flower. F. Anthesis.

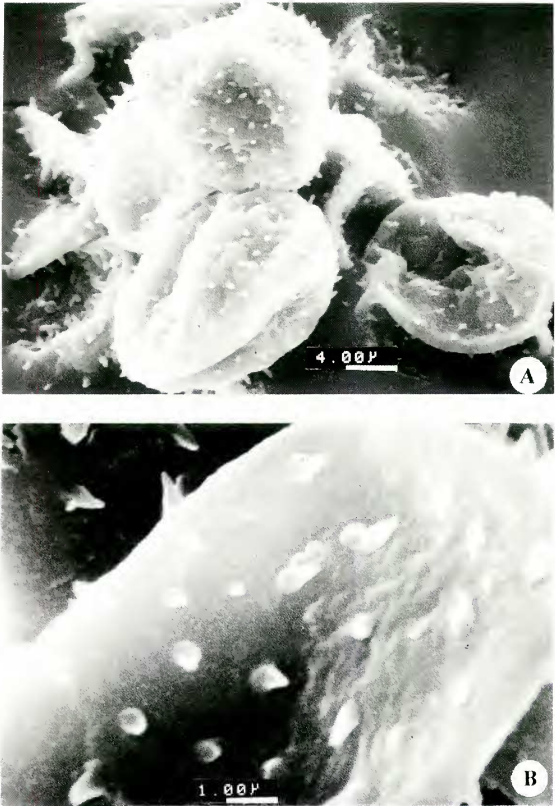


Fig. 2. SEM photomicrographs of pollen grain surface of *Wolffia papulifera* (Dritz s.n.). A. Slightly collapsed echinate pollen grains (250 ×). B. Echinate surface of pollen grain (1000 ×).

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REVIEW

A NEW FERN MANUAL

LELLINGER, DAVID B. 1985. A field manual of the ferns and fern-allies of the United States and Canada. 389 pp., 26 figs., 402 color illustrations. Smithsonian Press, Washington, D.C. ISBN 0-87474-603-5 (pbk) and ISBN 0-87474-602-7.

This handsome book is a welcome addition to the popular fern-literature of North America, and will be useful in other parts of the North Temperate Zone. It is particularly valuable as a book written for an amateur audience, in popular and understandable language. However, it also seems critically attentive to accuracy in a field noted for its complexity, wide differences of opinion, and for much superficial popular writing.

The stated purpose of the work is to aid in identifying all of the species of ferns and fern allies that are native to or naturalized in Canada and the United States, excluding Hawaii. In carrying out this purpose it is eminently successful. Descriptions of taxa at the three principal levels, family, genus, and species, are clear and accompanied by discussion and explanation where necessary. Keys are of the "bracket" type, to save space, and they work, so far as I have tried them. Line drawings are provided to illustrate some technical terms in the excellent glossary. A map and diagrams clarify ideas that are unfamiliar to many. And 402 magnificent color photos mostly by A. Murray Evans are provided for visual recognition, as well as to display the beauty of ferns. The photos are small, to keep the cost of the book down, but beautifully reproduced, nine to a page, in three columns, the numbering, curiously, from right to left on the page.